AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) An automated call routing system, comprising:

an automated call routing component to route an incoming call[[s]] to a member[[s]] of an organization and ~~providing~~ provide automated responses to one or more callers; and

a decision model, associated with the automated call routing component, that employs probability to determine likelihood of success in automatically routing the incoming call, the likelihood of success determined based in part on a sequence of system actions associated with the incoming call, to mitigate transferring the calls to an operator.

2. (Original) The system of claim 1, further comprising a speech recognition component for communicating with the callers.

3. (Currently amended) The system of claim 1, the decision model is trained from a data log that has recorded data of past activities and interactions with the automated call routing component.

4. (Currently amended) The system of claim 3, the data log contains data relating to at least one of a Speaker Found, a Speaker Not Found, an OperatorRequest, a Help Request, a Hang Up, a Maximum number of Errrors, a Not Ready indication, [[and]] or an Undefined category.

5. (Currently amended) The system of claim 1, the decision model processes one or more dialog features including at least one of system and user actions, session summary features, *n*-best recognitions features, [[and]] or generalized temporal features.

6. (Original) The system of claim 5, the *n*-best recognitions features are derived from a speech recognizer, and the generalized temporal features are included to cover trends between one or more *n*-best lists.

7. (Currently amended) The system of claim 1, the decision model employs a probability tree to determine ~~determining a~~ the likelihood of success in automatically routing the incoming call given a sequence of system actions.

8. (Currently amended) The system of claim 7, the decision model determines the likelihood of success based on ~~determining~~ p(SpeakFound|E), wherein SpeakFound is the member, E is observational evidence ~~E refers to~~ of system actions taken, and p is a probability, in part by counting a number of logged cases along an action sequence that resulted in success over a total number of cases along the sequence~~, wherein p is a probability~~.

9. (Currently amended) The system of claim 1, the decision model employs a dependency network that processes one or more categories of dialog features as input variables.

10. (Currently amended) The system of claim 9, the decision model processes at least one of a sequence of system actions, a count or number of alternates in an *n*-best recognitions list, a number of times a user attempted to speak a name, a largest score assigned by a call routing system, [[and]] or a number of dialog turns – defined as a question-answer pair.

[[12]] 11. (Currently amended) The system of claim 1, the decision model employs a Markov Dependency network.

[[13]] 12. (Currently amended) The system of claim [[12]] 11, further comprising a component to increase an amount of data in order to boost a partial model for dialog turns over a marginal model.

[[14]] 13. (Currently amended) The system of claim 1, the decision model includes at least one probabilistic model[[s]] to perform at least one dynamic decision[[s]] associated with [[about]] costs and benefits of shifting a caller to a human operator.

[[15]] 14. (Currently amended) The system of claim [[14]] 13, the at least one probabilistic model[[s]] provides at least one prediction[[s]] about an outcome[[s]] to enable administrators of automated call routing systems to specify preferences regarding the transfer of callers to a human operator.

[[16]] 15. (Currently amended) The system of claim [[15]] 14, the preferences are represented as a tolerated threshold on failure as a function of a current expected time that callers have to wait for a human operator, given a current load on operators. ~~The probabilistic models can also be employed in call center design.~~

[[17]] 16. (Currently amended) The system of claim 1, the decision model is employed to facilitate staffing decisions by taking into consideration at least one of probabilistic performance of an automated system to route calls successfully, preferences about wait time, characterization of caller volumes, [[and]] or time required for addressing callers in a queue waiting for an operator.

[[18]] 17. (Currently amended) The system of claim [[17]] 16, the queue is optimized based on a queue-theoretic formulation.

[[19]] 18. (Currently amended) A computer readable medium having computer readable instructions stored thereon for implementing at least one of the call routing component and the decision model of claim 1.

[[20]] 19. (Currently amended) A system that facilitates call routing, comprising:

means for interacting with a caller making a call to a user;

means for automatically directing the caller to [[a]] the user; [[and]]

means for determining probability of success in automatically directing the caller to the user, the probability of success determined based in part on a sequence of system actions associated with the call; and

means for performing a decision theoretic analysis before directing the caller to [[a]] the user, the decision-theoretic includes a cost-benefit analysis weighing the benefits of transferring the caller to an operator.

[[21]] 20. (Currently amended) A method for automatically routing calls, comprising:

determining a utility model for employment with a call routing system;

training the utility model from a log of past system call activities; [[and]]

employing probability to determine likelihood of success in automatically directing a call an organization member, the likelihood of success determined based in part on a sequence of system actions associated with the call; and

automatically directing the call[[s]] to at least one of [[an]] the organization member [[and]] or an operator, based in part on the likelihood of success.

[[22]] 21. (Currently amended) The method of claim [[21]] 20, the utility model is applied to a user function, $u(n,m,w)$, associated with a process of call routing, the user function is a function of a number of automated dialog steps taken, n, a total expected number of steps that will be taken with an automated routing system, m, and a wait time, w, for transferring to a human operator.

[[23]] 22. (Currently amended) The method of claim [[22]] 21, further comprising processing user frustrations.

[[24]] 23. (Currently amended) The method of claim [[22]] 21, further comprising processing negative emotional reactions to working with an automated system versus a human operator.

[[25]] 24. (Currently amended) The method of claim [[22]] 21, further comprising performing a cost-benefit analysis of routing actions under uncertainty, considering a number and nature of at least one step in a dialog.

[[26]] 25. (Currently amended) The method of claim [[21]] 20, further comprising determining a utility of an interaction in accordance with a time cost of an interaction.

[[27]] 26. (Currently amended) The method of claim [[26]] 25, further comprising generalizing a conversion of steps to an effective total time of an interaction, wherein frustration is captured by increases in an effective total time of specific steps.

[[28]] 27. (Currently amended) The method of claim [[26]] 25, further comprising a pre-computation that is performed to yield, $p(\text{xfer}|E,\xi)$ and $p(\text{success}|E,\xi)=1 - p(\text{xfer}|E,\xi)$.

[[29]] 28. (Currently amended) The method of claim [[26]] 25, further comprising a pre-computation of probability distributions, $p(m|E,\text{xfer},\xi)$ and $p(m|E,\text{success},\xi)$ and an expected number of steps for conditions, labeled $<m>$ and $<m'>$, respectively.

[[30]] 29. (Currently amended) The method of claim [[21]] 20, further comprising determining an expected total wait time with continuing an automated interaction, t^a at respective points in a dialog under uncertainty in failure as:

$$t^a = p(\text{xfer}|E,\xi)\,(t(<m>) + w) + (1 - p(\text{xfer}|E,\xi))\,(t(<m'>)[[.]],$$

wherein a wait time associated with a courteous immediate transfer into a queue for interacting with a human operator is w.

[[31]] 30. (Currently amended) The method of claim [[30]] 29, further comprising determining a utility of call handling as follows:

$$\textit{Utility of call handling} = p(\text{xfer}|E,\xi)\,u(t(n)+t(<m>) + w),\ C) + (1 - p(\text{xfer}|E,\xi))\,u(t(n)+t(<m'>).$$

[[32]] 31. (Currently amended) The method of claim [[31]] 30, further comprising determining the utility of call handling as follows:

$$\textit{Utility of call handling} = 1\text{-}p(\text{fail}|E,\xi)\,(p(\text{xfer}|E,\xi)\,u(t(n)+ t(<m>) + w,\ C,\ \text{success}) + (1 - p(\text{xfer}|E,\xi))(u(t(n) + t(<m'>),0,\ \text{success}) + p(\text{fail}|E,\xi)\,u(u(t(n)+ t(<m>),0,\ \text{fail}).$$

[[33]] 32. (Currently amended) The method of claim [[32]] 31, where cost of handling the call with a human operator C depends on needs or goals of the caller, and is inferred from evidence.

[[34]] 33. (Currently amended) The method of claim [[32]] 31, further comprising determining expected costs via inference of a probability distribution over Cost given evidence gathered so far, $p(C|E,\xi)$.

[[35]] 34. (Currently amended) The method of claim [[21]] 20, further comprising providing online sensing of current wait times for calls being transferred to a human operator.

[[36]] 35. (Currently amended) The method of claim [[21]] 20, further comprising at least one of: creating an end-to-end system that continues to at least one of log, monitor, and build models; [[and]] or

automatically setting parameters, generating reports, and generating traces, for validation and auditing of actions.

[[37]] 36. (Currently amended) The method of claim [[21]] 20 supporting an application including at least one of touch-tone routing and speech recognition.